Gap-X-Gap studies for $\sqrt{s}$ = 1960GeV and 900GeV

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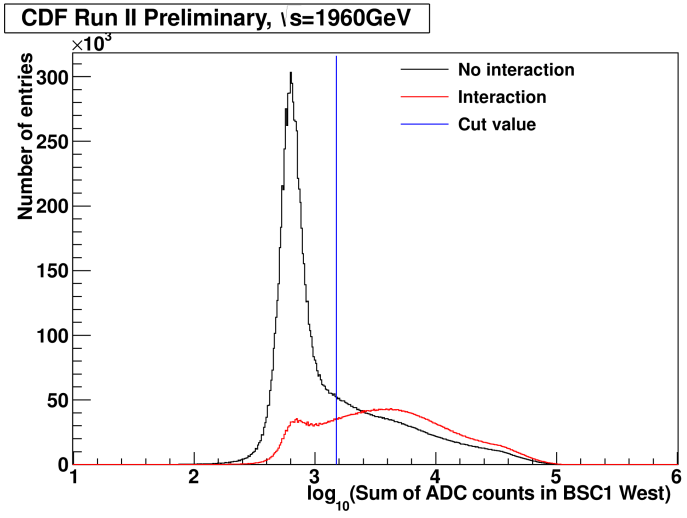
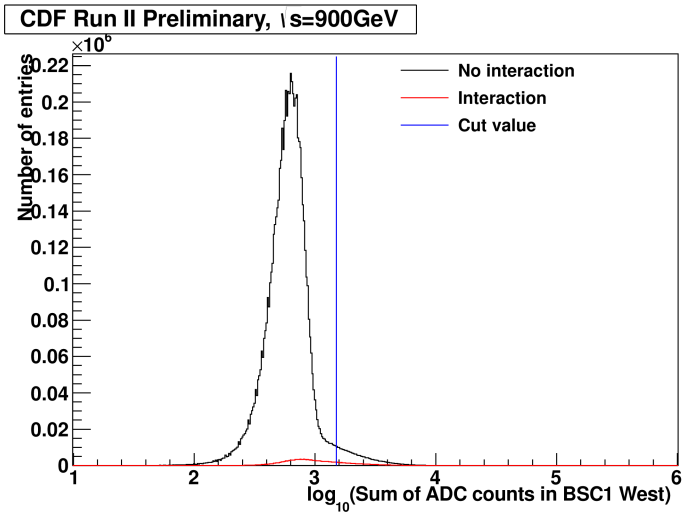
Data sample

- Datasets used:
  - gdifap – 1960 GeV
  - gdifar – 900 GeV
- Same trigger requirement: DIFF_TWO_CJET0.5_PLUGVETO_0.75
  - 2 central ($|\eta|<2.11$) towers with Et > 0.5 GeV
  - Signal in plug ($2.11<|\eta|<3.64$) with Et <0.75 GeV
  - BSC1 and CLC in veto
  - L=6.98/pb – 1960 GeV and L=0.075/pb – 900 GeV
  - Gaps at least from $|\eta|=2.11$ to $|\eta|=5.9$
  - We also use extended gaps, from $|\eta|=1.0$

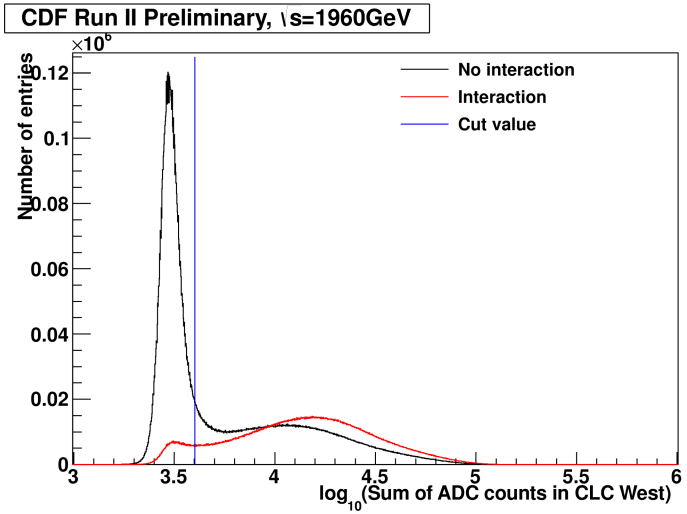
Gap cuts – idea and BSC1 West

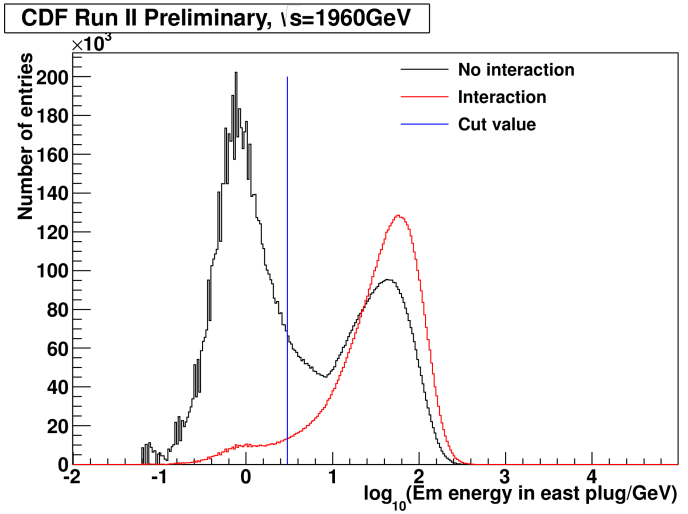
- To determine noise levels in subdetectors we divide zero-bias sample from same periods into two:
  - No Interaction:
    - No tracks
    - No CLC hits
    - No muon stubs
  - Interaction:
    - Opposite

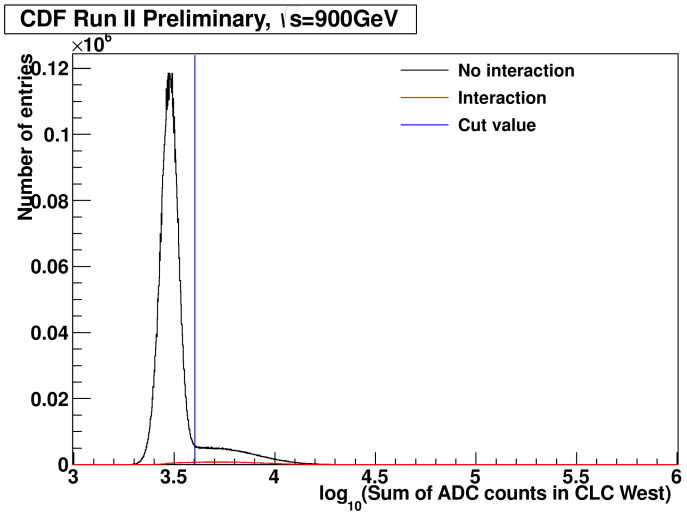


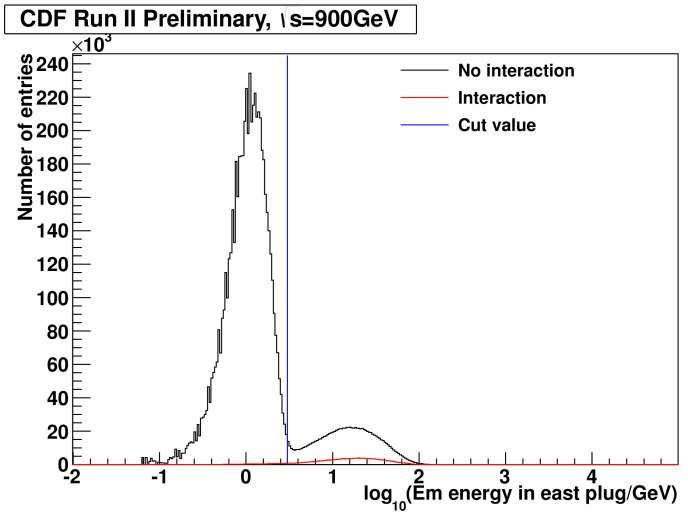


CLC West and Em Plug East



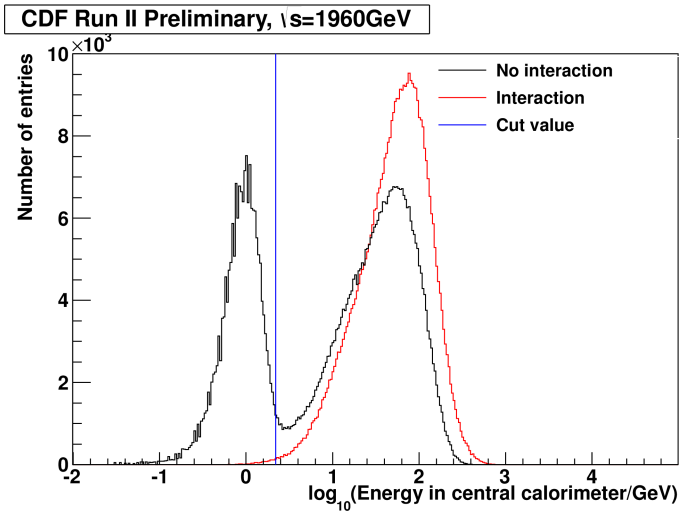


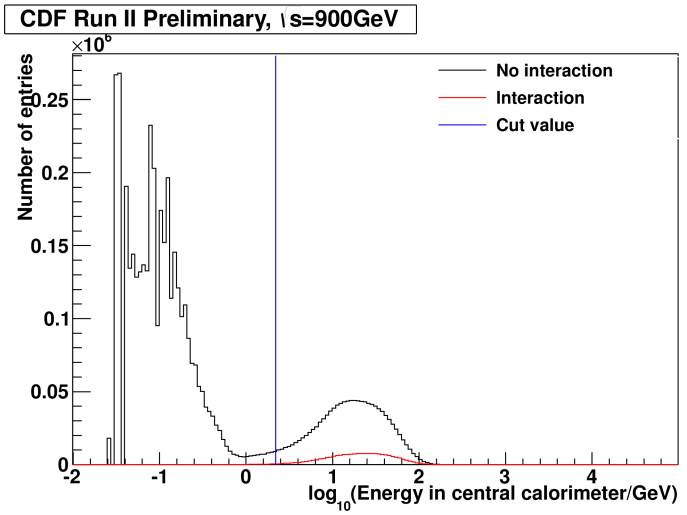




Exclusivity cuts in central region

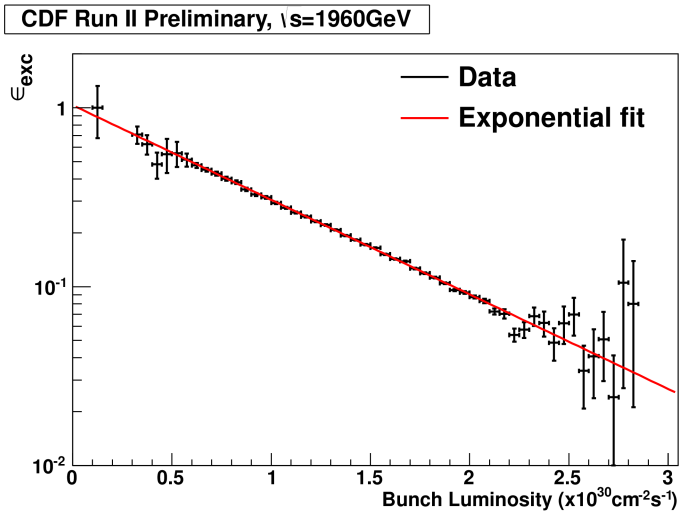
- To determine exclusive 2-4 tracks we apply similar technique in central region, just excluding cones of radius 0.3 around each track extrapolation.

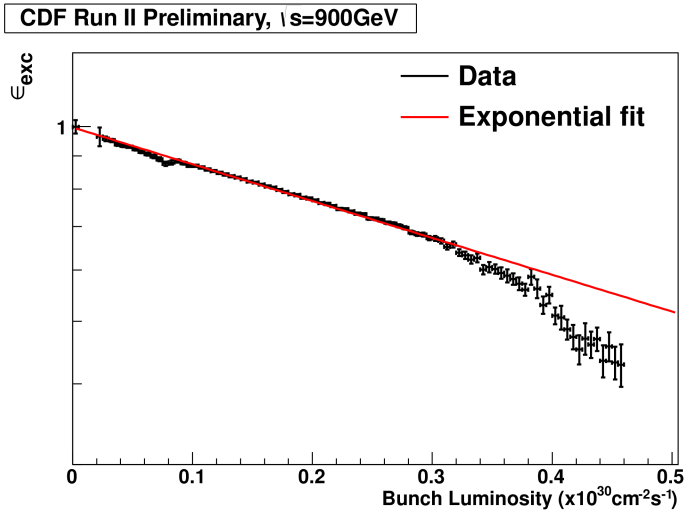




Effective exclusive luminosity

- We determine efficiency of having no-pileup using zero-bias sample. We measure ratio of empty events (all detectors on noise level) to all events.
- Should drop exponentially with bunch luminosity and be equal 1 at L=0. Slope corresponds to total inelastic cross section:
  - 56.7 mb – 1960 GeV
  - 61.0 mb – 900 GeV
- Effective luminosities:
  - 1.16/pb – 1960 GeV
  - 0.059/pb – 900 GeV

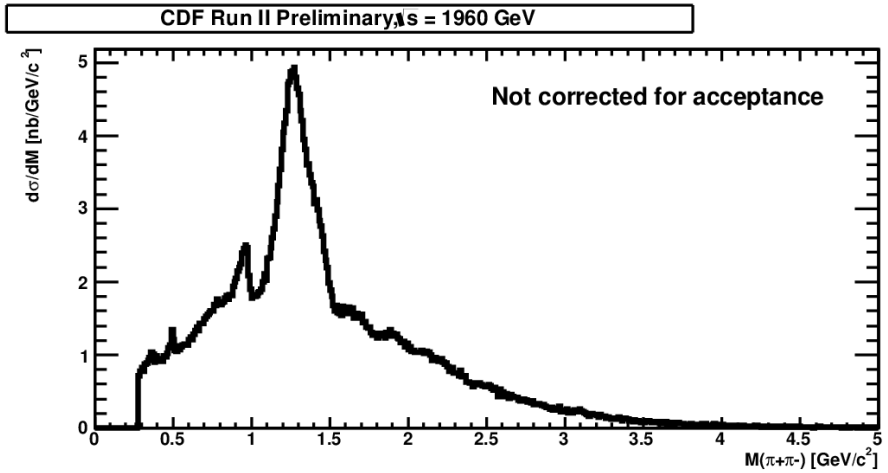


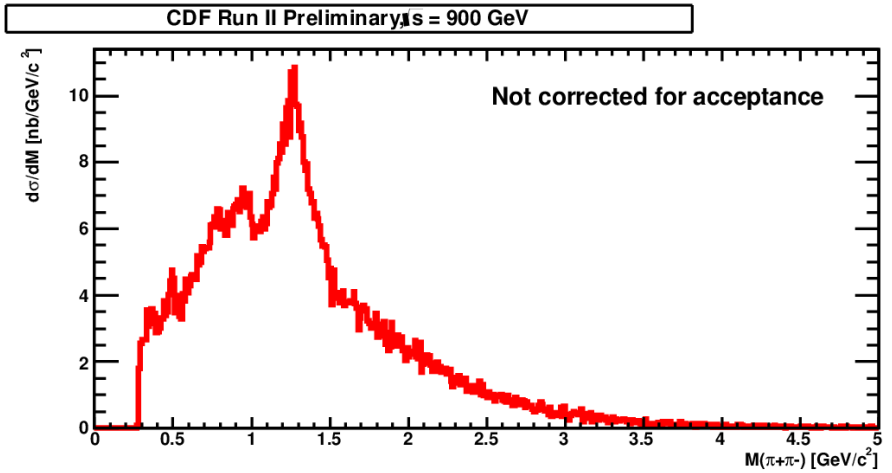


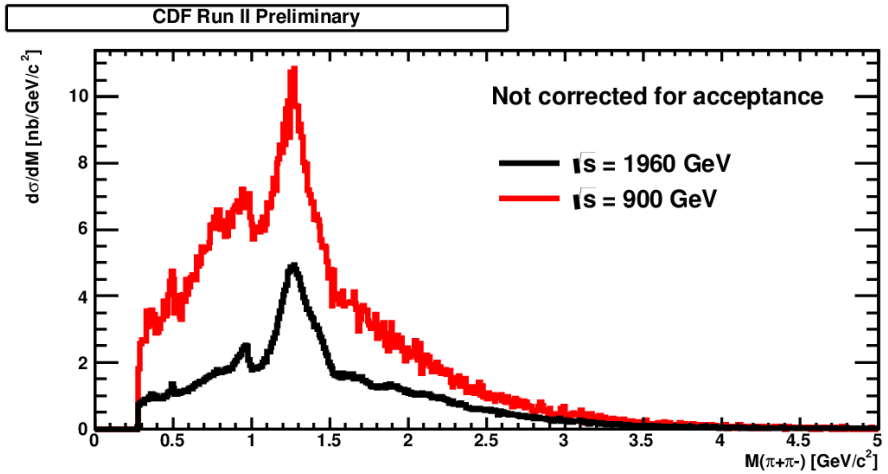
2 Exclusive tracks on primary vertex

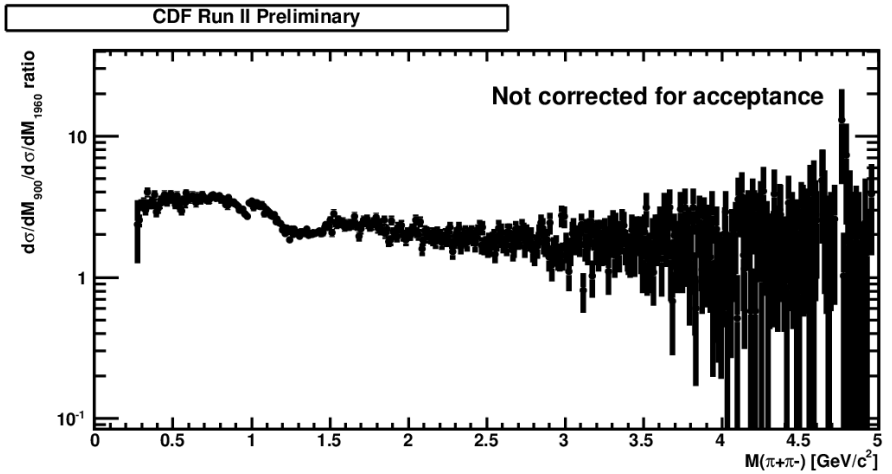
- Additional cuts:
  - Small impact parameter < 0.5 mm
  - Pt > 0.3 GeV
  - 3D opening angle <3.1 (cosmics cut)
  - Opposite charge tracks

Mass spectra assuming 2 Pions |η|<2.1

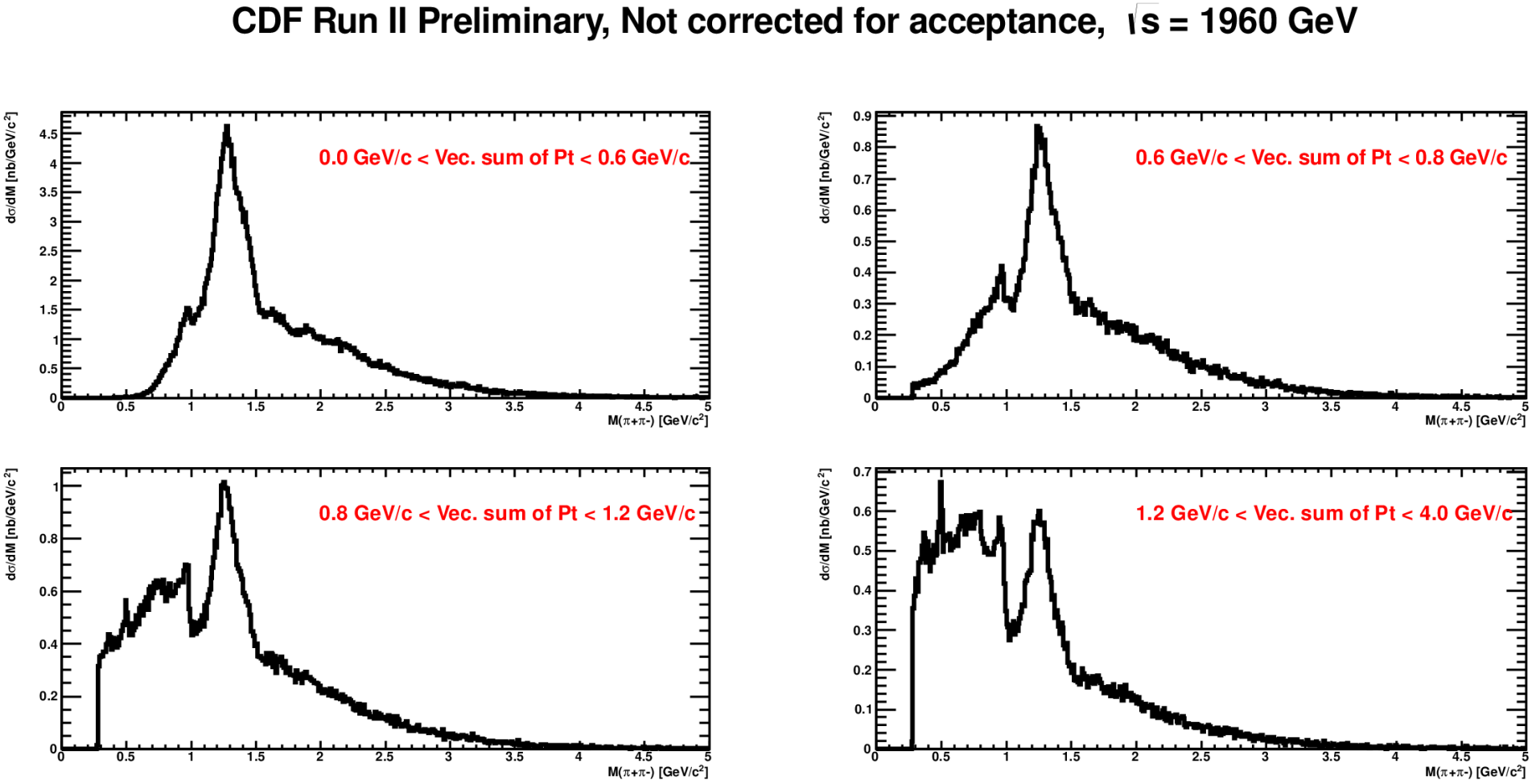




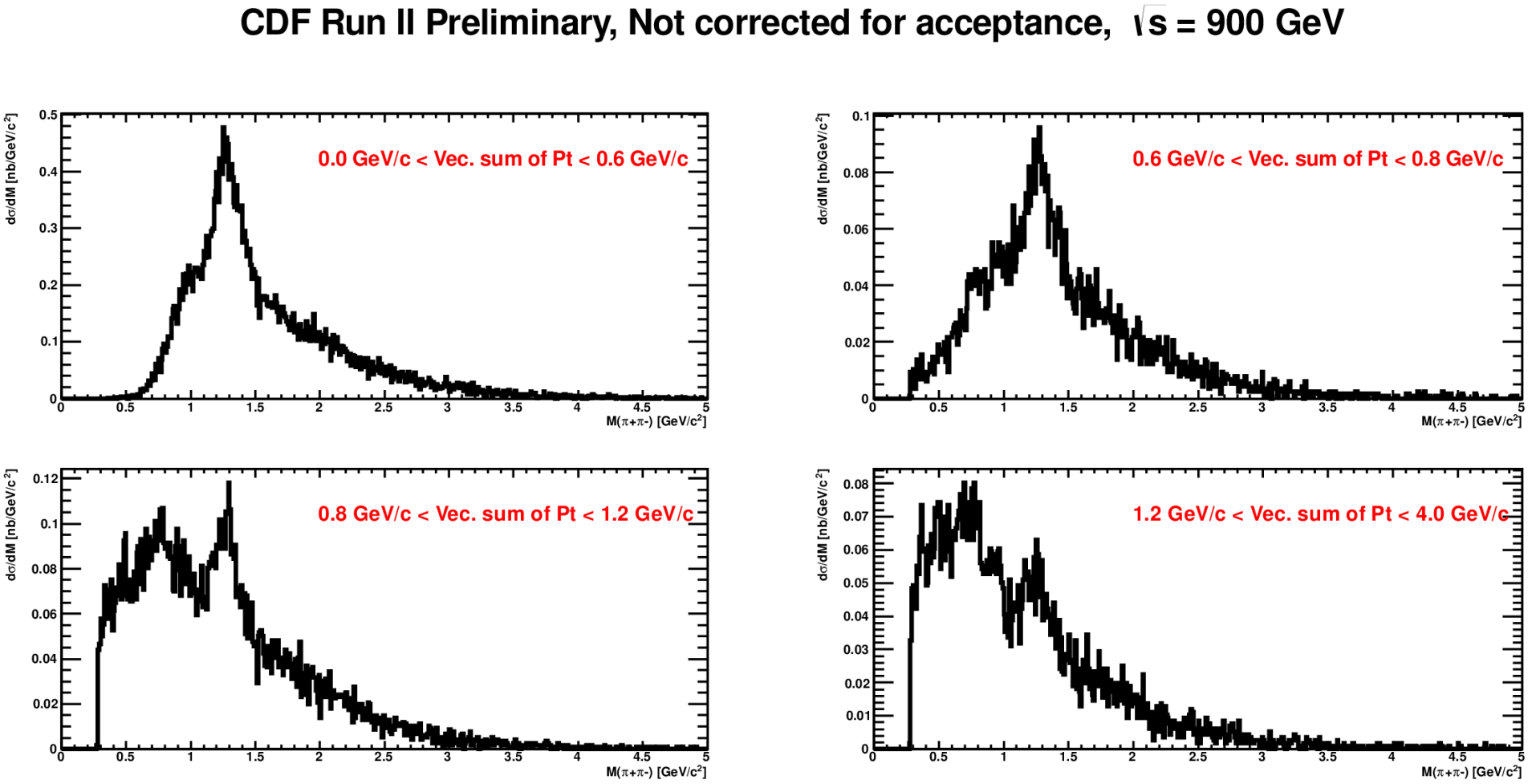




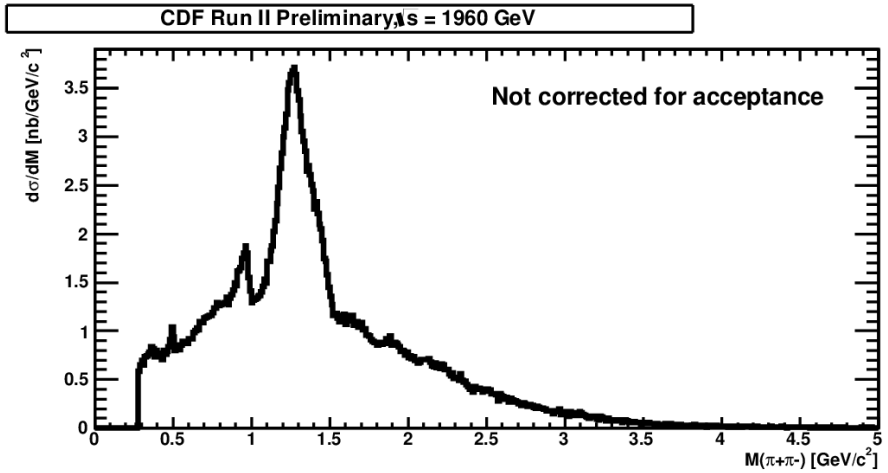
Mass spectra – Pt dependence |η|<2.1

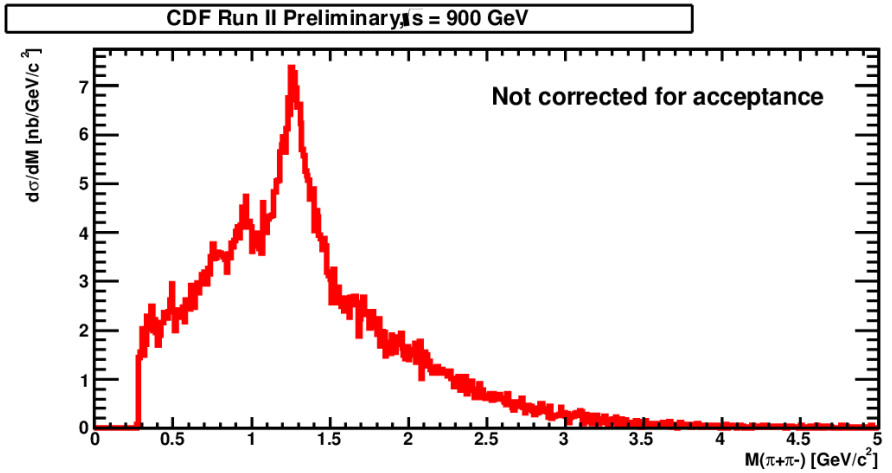


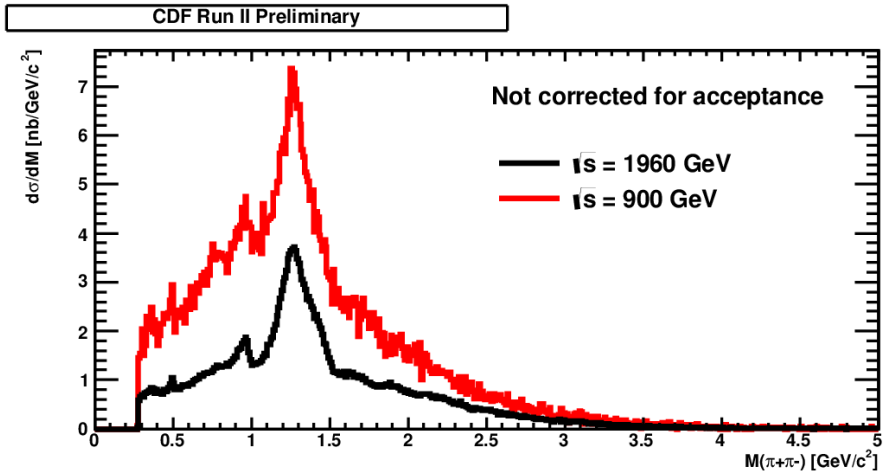
Mass spectra – Pt dependence |η|<2.1

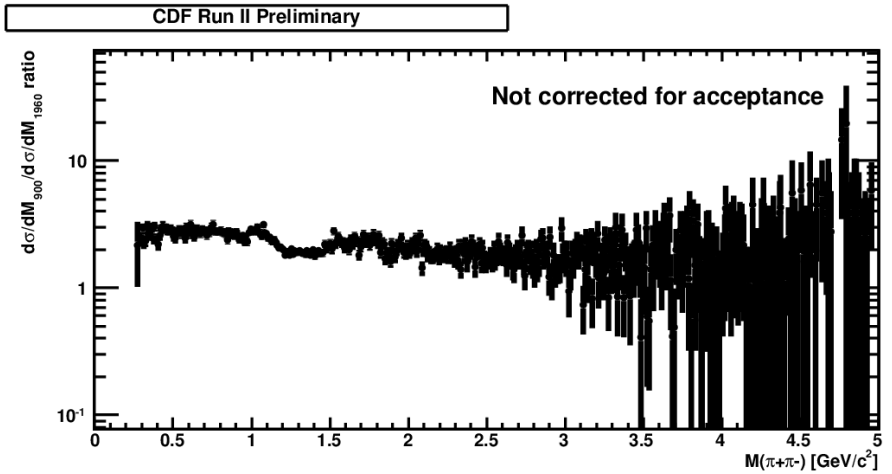


Mass spectra assuming 2 Pions |η|<1.0

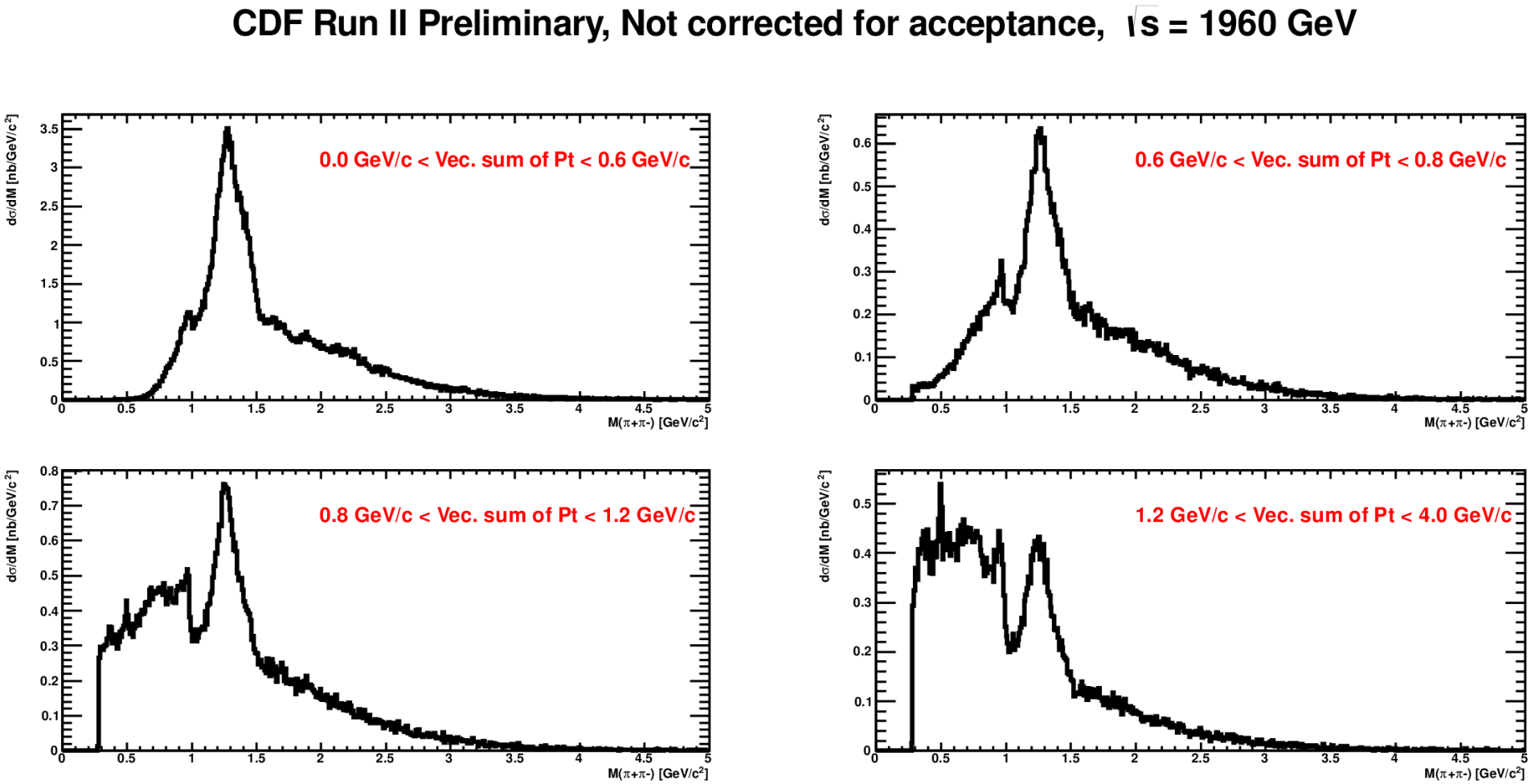




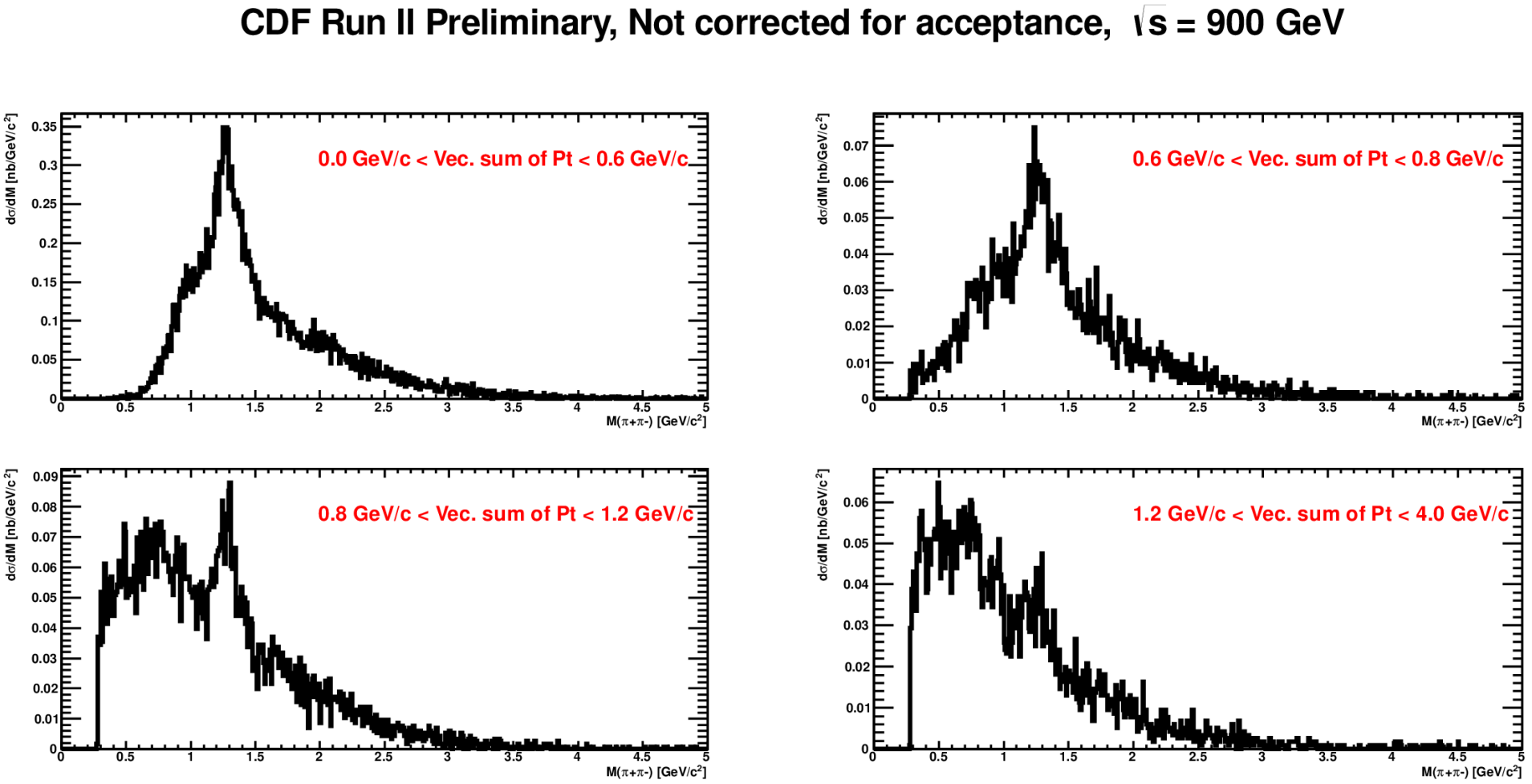




Mass spectra – Pt dependence |η|<1.0

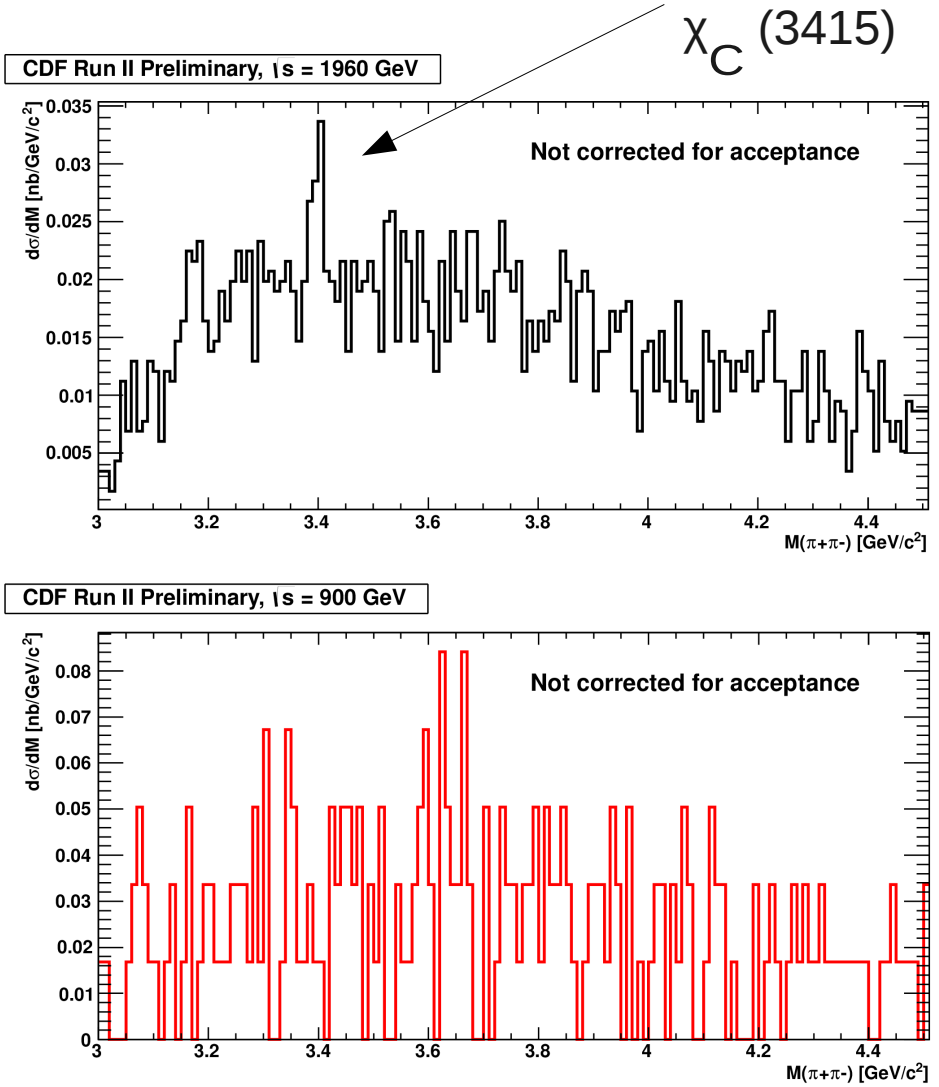


Mass spectra – Pt dependence |η|<1.0



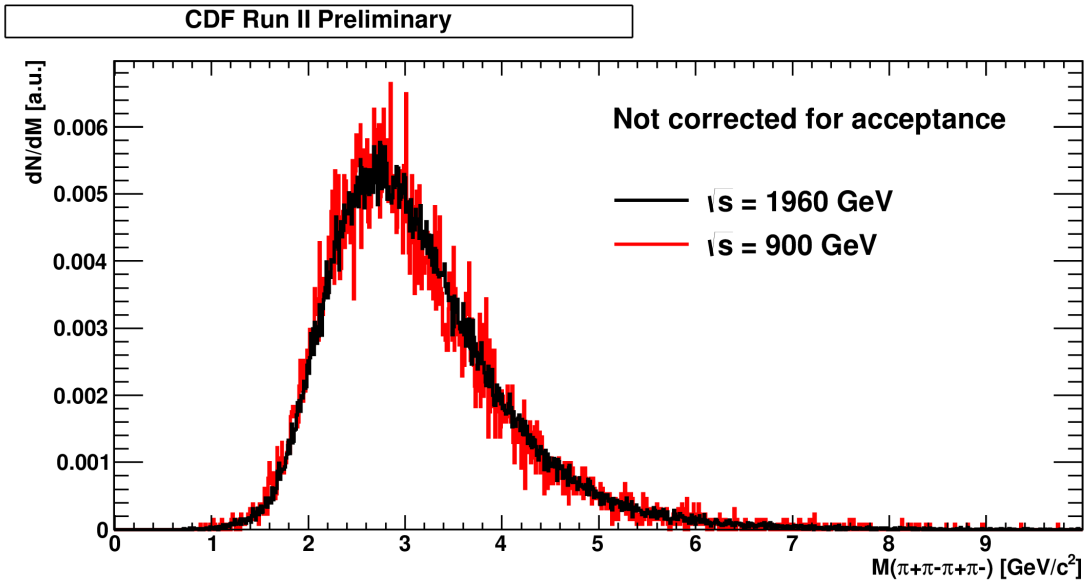
χ_c search

- Cuts to enhance signal/noise ratio for χ_c:
  - $|\eta|<1.0$
  - Pt of each track > 1.5 GeV/c
  - $\Delta\varphi < 2.1$
  - Assuiming tracks to be pions



4 Tracks on primary vertex

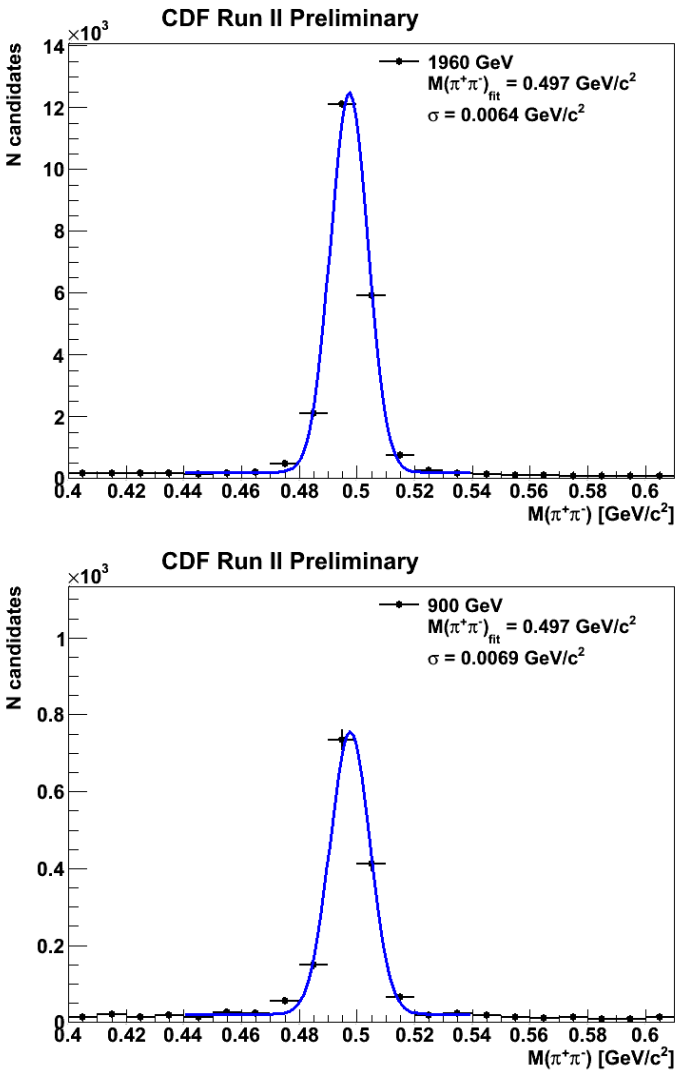
- Additional cuts:
  - Small impact parameter or reconstructed vertex
  - Pt > 0.3 GeV
  - Total charge = 0



- Assumed to be pions

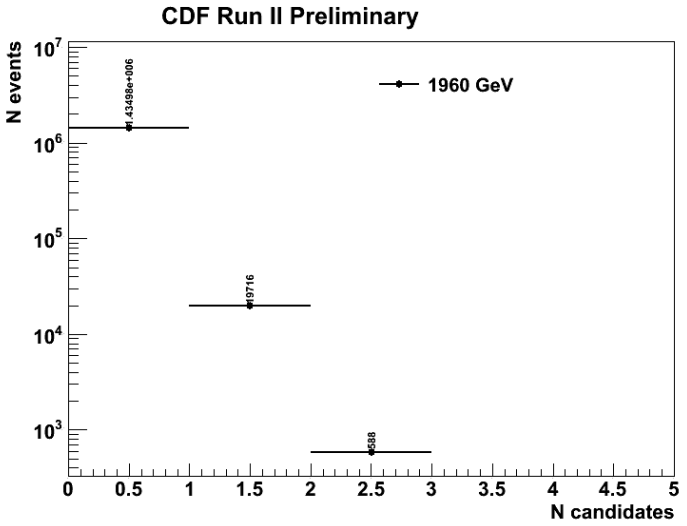
4 Tracks with displaced vertices

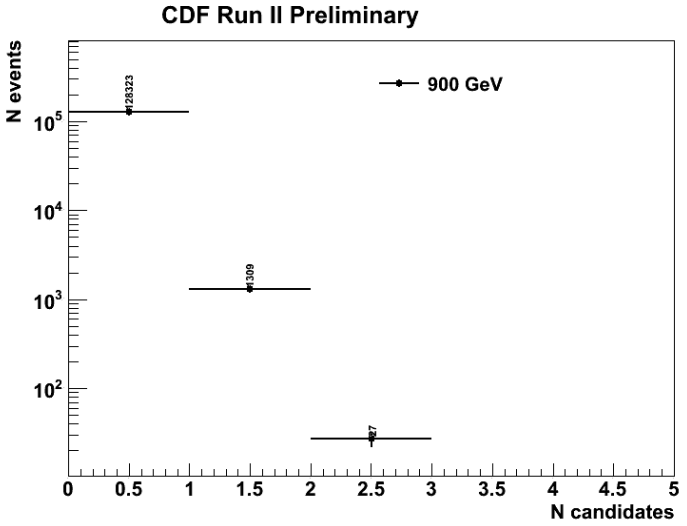
- Additional cuts:
  - Big decay length - Lxy
  - Collinearity of primary-secondary vertex direction and Pt direction
  - Conversion veto
- Invariant mass of 2 tracks assuming pions with K0s fit:



K0s pairs

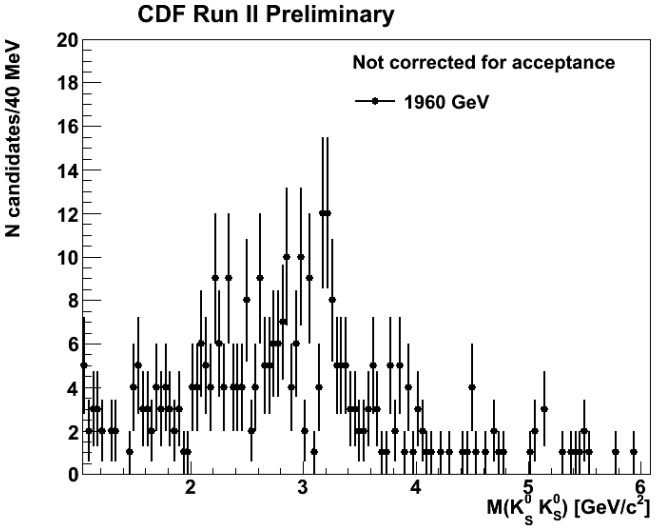
- After finding one K0s with big Lxy, good colinearity and mass consistent with K0s we look for other pair mass.
- If second pair is in mass window, we call it a K0s

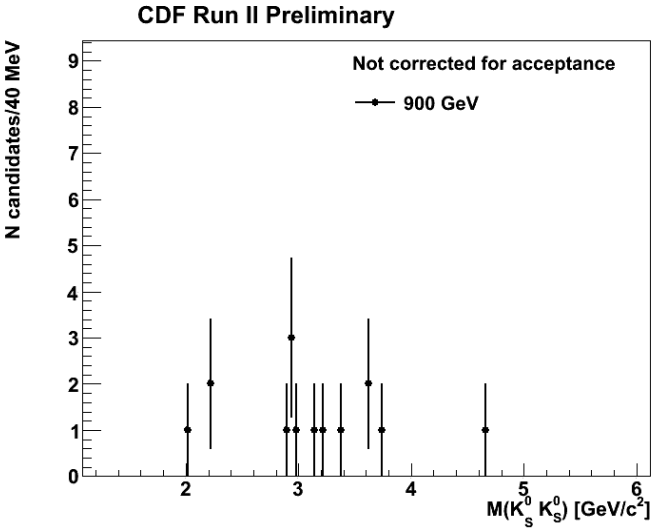




K0s pairs – Invariant Mass

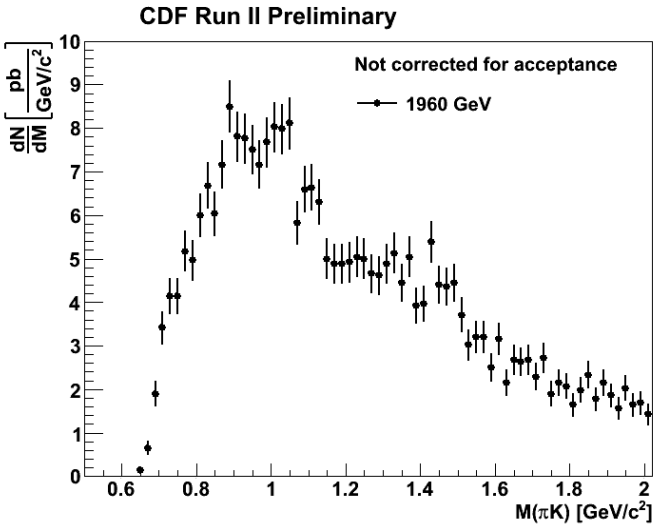
- Selected K0s pairs invariant mass:

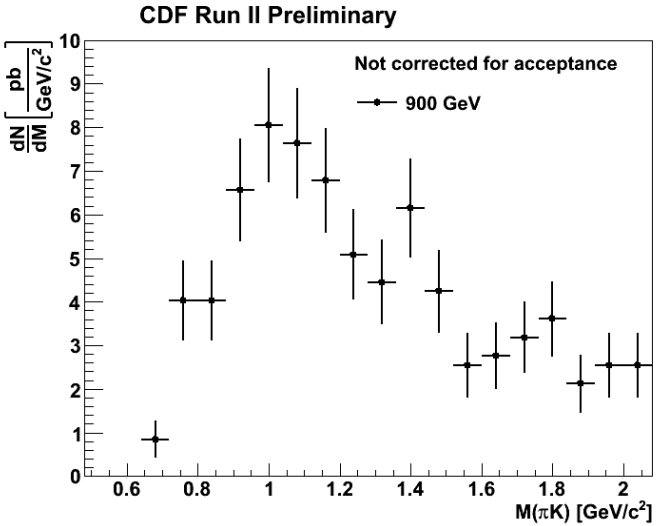


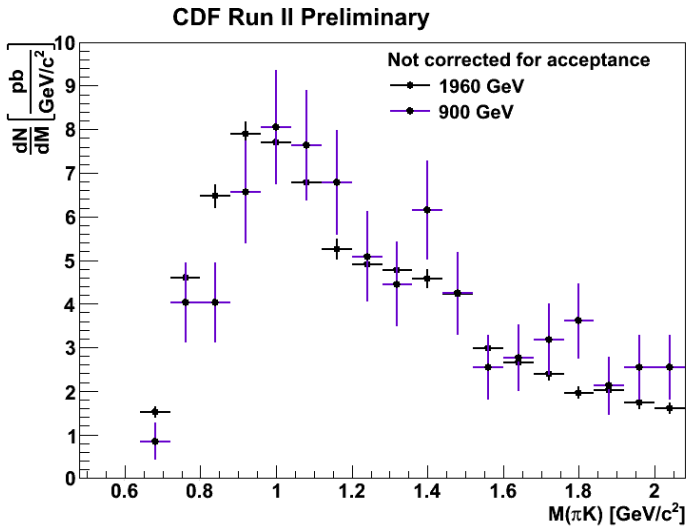


K0s + K* etc. search

- If second pair comes from beamline, we assume that one of the particles is Kaon, and second is Pion, to look for K* etc.







More to be done:

- Correcting for acceptance
- Including 2 tracks > 2 GeV/c trigger to enhance χ_C signal
- Compare with Monte Carlo
- Approve results
- Write papers
- Complete by Summer

Thank you